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(54) **DEPTH-BASED TOUCH DETECTION**

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(52) **U.S. Cl.**

CPC ***G06F 3/0425*** (2013.01); ***G06K 9/00087*** (2013.01); ***H04N 13/271*** (2018.05); *G06F 2203/04101* (2013.01)

(58) **Field of Classification Search**

CPC G06F 3/04847; G06F 3/0488; G06F 3/04842; G06F 3/017

See application file for complete search history.

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(57) **ABSTRACT**

Systems, methods, and computer readable media to improve the operation of detecting contact between a finger or other object and a surface are described. In general, techniques disclosed herein utilize a depth map to identify an object and a surface, and a classifier to determine when the object is touching the surface. Unlike the prior art, a measure of the object's "distance" is made relative to the surface and not the camera(s) thereby providing some measure of invariance with respect to camera pose. The object-surface distance measure can be used to construct an identifier or "feature vector" that, when applied to a classifier, generates an output indicative of whether the object is touching the surface. The classifier may be based on machine learning and can be trained off-line before run-time operations are commenced. In some embodiments, temporal filtering may be used to improve surface detection operations.

20 Claims, 7 Drawing Sheets